

Design, Planning and Analytical Process for Multi Storied Buildings

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ABSTRACT

Valuable urban land is shorting at a very fast rate with the growing demand of increasing population. The conventional low rise development cannot meet the rising demand of more number of dwelling units per unit area so the only solution is high rise development with enough open spaces around the buildings for proper light and ventilation.

KEYWORDS: People, urban mass, urban land, population, dwelling units, per unit area, open space, buildings

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ANALYSIS AND DECISIONS

SITE AREA (Assumption) = 120m X 120m
= 14,400 sqmts
F.A.R. = 1.5
Grand Coverage = 30% to 33%
Total build up area = 14400 x 1.5
= 21,600 sqmts
Grand coverage = $\frac{14,400 \times 30}{100}$
= 4,320 sqmts.
No. of Flats = 4,320 (120 sqmts for one flats)
(12 sqmts – 10% of 120 sqmts for service area)

Height allowed maximum by laws – 100 ft
Height per floor to floor – 3m
Maximum floor 10 = Ground floor + 9 storied
Proposed No. of floors = 10 Nos.
132 x 10 = 1,320 sqmts.
No. OF UNITS ON ONE FLOOR = $\frac{21,600}{1,320}$
= 16.36 (MAX)

PROPOSED TAKING FOUR BLOCKS HAVING ONE BLOCK OF FOUR UNITS EACH 10 STORIED
NO OF UNITS IN ONE BLOCK = Ground floor + 9 storied
= 36 FLATS
= 36 x 4 per floor
CAMPUS = 144 FLATS = 720 OCCUPANTS
(Per family 5 member)

CLIMATOLOGICAL MEASURES:

- The orientation of all the block are in such a manner that all the houses get direct sun light in either morning or evening hours of the day.
- The prevailing direction of wind is South–West to North-East on the wind ward side, openings are provided into the blocks,
- Courtyard form for the building shall act to project the internal environment from harsh climate. Also the East-West axis of the open space between front and rear with smaller.
- Frames of column and beams around the façade help in casting shadows on the walls and thereby Reduce the heat gain.

MATERIALS, STRUCTURE AND CONSTRUCTION

- Structure gird module.
- R.C.C. slab and frame construction with brick infill walls is the main constructional process.
- Brick and concrete paving in the open spaces to make surfaces low in maintenance.

ANALYSIS OF STRUCTURAL SYSTEM:

The trend system of structural framing.

- Reinforcement concrete frame.
- Flat Plate _ One way grid
- Two way grid
- Lift Slab.
- Slip form construction.
- Prestressed floor system.
- Shear walls/prestressed concrete.

REINFORCEMENT CONCRETE FRAME

- A. Modular system
- B. Irregular layout
- C. Exterior Columns
- D. Columns

MODUALR SYSTEMS:

- Most columns are located on grid lines of uniform spacing.
- Necessity dictated by the need to provide space under apartment for parking.
- It is used as an Aesthetic element in Architectural design.
- No complications of beams.
- Systematic approach.
- Symmetry in design is maintained.

AESTHETICAL CONSIDERATIONS

- An Expressionistic language is used to conscribe the space. Expression of vertical and horizontal elements gives the form its functional and precise appearance.
- Relieved fenestration to high light the important and vital content of the buildings.
- Circulation modes like staircase and lifts are highlighted in their expression to signify their importance.
- Brick walled merge with the local landscape, concrete grid and relate to the traditional architectural, image.
- Land scaping elements of trees, green areas, shrubs, street furniture and plants amidst paved plazas are used to suit the climate and environment.

SITE ANALYSIS

PHYSICAL FEATURES OF SITE:

- Area of plot for B.D.A. scheme is 14,400 sqmts.
- The level of the site is about 1.5m below the road level.
- The soil condition is black cotton soil upto 0.2 to 0.5m depth and red sand stone underneath.

EXISTING INFRASTRUTURE

- sewage line is available.
- water supply is available .
- Electricity and telephone lines are available.
- Surface drainage is to be worked out. Only outlet for the drains is available.
- Public transport facility is available.

THEME

The proposed multi storied apartments provided with the community facilities necessary for the inhabitants,

The residential units are grouped into four multi storied blocks leaving open spaces around, for play and other community activities, shops are also provided in the blocks.

Inhabitants approached from the side roads only, large plaza and adequate parking spaces, road side as well as covered parking are provided on ground floors.

The residential units are in the form of multi storied blocks which have separately approach roads, gardens and play areas and parking areas.

So, the basic design criteria was to create a multi storied apartments where the inhabitants have the advantage of nearby work areas. They are kept away from the fuss of the crowd, and other disturbances of commercial part.

FORM AND STRUCTURE :

The basic module is taken as 3mx5m. Building blocks with staircase and lifts, the side by side from the lobby at the centre is the typical floor plan.

Every units has one entrance, drawing/dining, kitchen, and three bed rooms, toilets, and balcony, total areas being 1200 sqft. Or 120 sqmts,

ANALYSIS OF UNIT DESIGN

In physical terms, the function of a house is to provide:

- A. Protection from the climate.
- B. Accommodation for living and sleeping.
- C. Facilities for cooking, bathing, washing.

PROTECTION FROM THE CLIMATE:

Such as excessive heat, rain, etc. can be secured by proper orientation. Also adequate provision must be made for securing the maximum amount of light, and where necessary, direct sunlight. Cross ventilation should also be taken into consideration. The best orientation for.

ACCOMMODATION FOR LIVING AND SLEEPING:

Generally this takes the form of dividing up the total area into various rooms such as living rooms and bedrooms. To determine what form this accommodation should take, It is necessary to know the habits of the people for whom the house is being designed. In large scale housing scheme. The Individual occupant is unknown; therefore, it would be logical to organize the space in a more flexible manner. The structural system, economy, services and access some times do not permit the organisation of such flexible units in the case of developments which are more than two floors, The emphasis is then on providing the maximum number of habitable rooms in a given area,

DIVISION OF SPACES

It is usually best to provide a large living cum dining area with attached kitchen, or a dining area and living area as separate rooms which can be converted into one area at the time of big parties, In both the cases kitchen/pantry can Be attached with the dining area and can be kept away. Both the possibilities should be tried in housing as the people have liking and disliking for both the cases. Bed rooms should have direct access, from the lobby. Storage of trunks and large articles should also be taken into account. A store or a deep cupboard should be provided. In designing the individual rooms the orientation, wind direction must be kept in mind.

FACILITIES FOR COOKING, BATHING AND WASHING:

The kitchen is an important factor in house design, as the housewife spends a large proportion of her time in it. It has been described as a laboratory and the sequence of operations may be listed as follows

- Delivery and collection of goods; storage.
- Preparation of food.
- cooking.
- Preparation of dining table.
- Distribution of food to table.
- Return of food and crockery from table.
- Washing up.
- Putting away washed crockery, glass, cutlery.

The Position of sink should be provided so as to convenient. Kitchen should have an exhaust fan and large window. Adequate arrangement for storage should be done.

TOILETS- should be properly ventilated and should provide a minimum of a w.c. a wash basin, and a shower or tub-bath. It is better to have a dressing room with the toilet rather than using the bed room as a dressing room. It is generally not possible to have a separate washing space or laundry. This activity is usually carried out in the bathroom or kitchen the problem of drying the clothes is an important one in the flats.

In general it may be said that the architectural consideration in the planning of large scale housing scheme, consist, firstly in the development of unit plans, Which lend themselves to repetition. Secondary, waste space should be eliminated, and a complete plan with economy of circulation secured. Minimum but adequate room sizes should be worked out and a correct relationship between rooms established.

ANALYSIS OF SPACE REQUIREMENTS:**List of space with areas;**

Sr.	Item		Area in sq. mts (Approx)
1.	Drawing room	=	14.06
2.	Living room	=	17.76
3.	Dining room	=	10.56
4.	Double bedroom	=	14.7
5.	Single bedroom	=	8.91
6.	Kitchen	=	6.48
7.	Bathroom	=	4.14
8.	Lavatory	=	2.04

Standard sizes:

Sr. No.	Item	Sizes in mm
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FOR BATHROOM:

1.	Bath Tub	-	760 x 1680
2.	Basin	-	560 x 460
3.	European W.C.	-	710 x 810
4.	Clearance	-	100 to 150

FOR LAVATORY:

1.	Indian W.C.	-	787 x 710
2.	Clearance	-	150 to 200

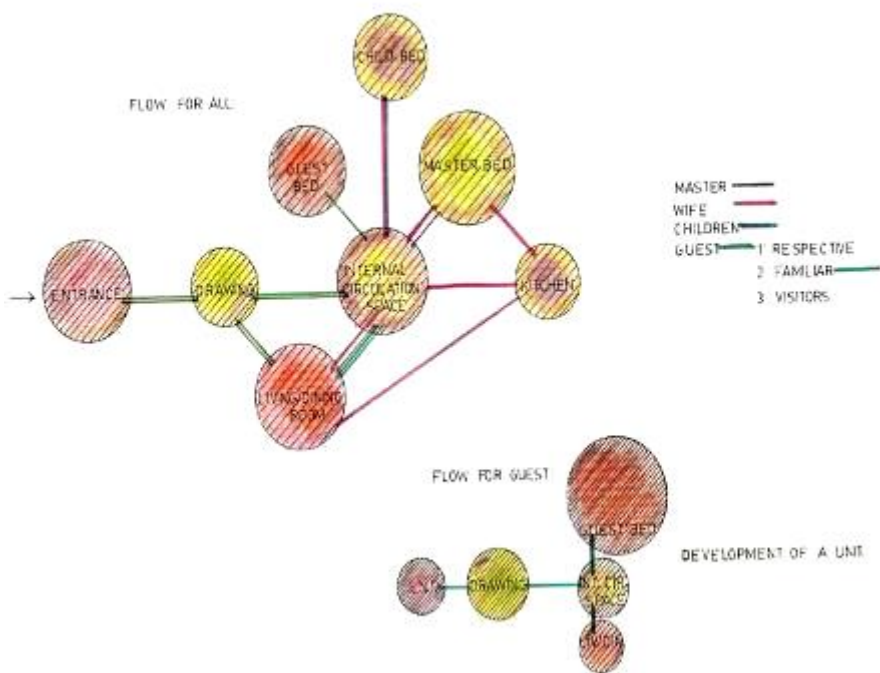
SPACE RELATIONSHIP

Very close /	Occasionally 0	Rare x					
	Entrance	Drawing	Int. Cir. Space	Living/Dining	Bedroom	Kit	Toilet
Entrance	0	/	0	/	/	/	X
Drawing	0	0	0	/	/	/	/
Internal Circulation Space	/	0	/	/	/	X	/
Living/ Dining		/	/	/	/	/	/
Bedroom		/	/	/	X	/	/
Kit		/	/	/	X	/	/
Toilet		X	/	/	/	/	/

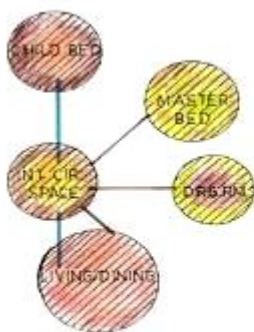
SPACE -RELATIONSHIP

Very Close /	Occasionally 0	Rare x						
	Entrance	Ground Floor (p) Covered	Core/ Lobby	Lift/ Stair	Parking (Open)	Shops	Services	Recreation
Entrance		/	/	/	/	x	0	0
Ground Floor (p) Covered	/	/	/	0	/	/	/	/
Core/ Lobby	/	/	/	/	/	/	/	/
Lift/ Stair		/	/	/	/	/	/	/
Parking (Open)	/	/	/	/	/	/	/	/
Shops		/	/	/	/	/	/	/
Services	0	/	/	/	/	/	/	/
Recreation	0	/	/	/	/	/	/	/

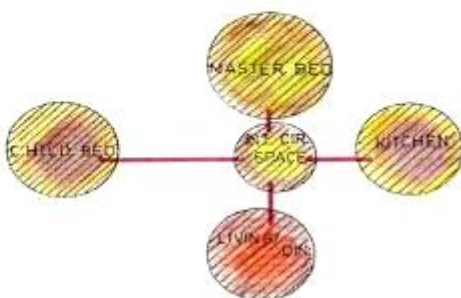
FLOW DIAGRAMS:



FLOW FOR CHILDREN& MASTER:

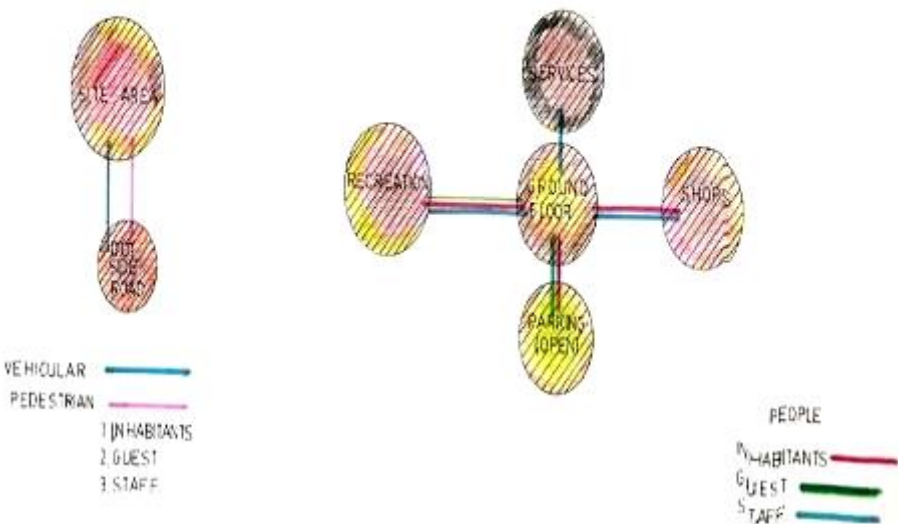


FLOW FOR HOUSE WIFE:

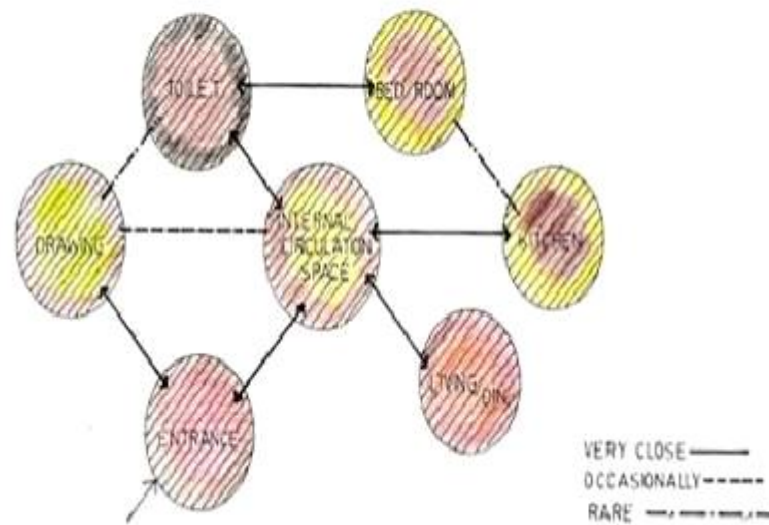


FLOW DIAGRAMS:

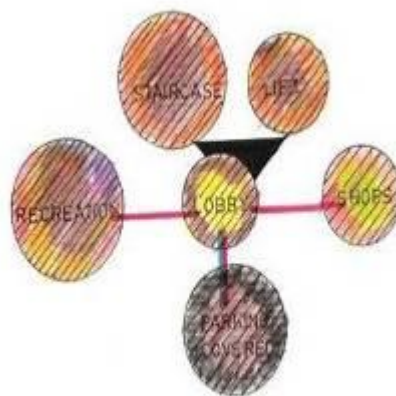
HORIZONTAL FLOW:



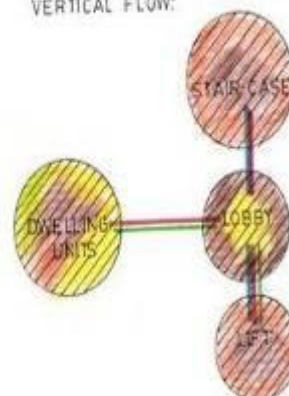
SPACE -RELATION SHIP-DIAGRAM:



HORIZONTAL FLOW:



VERTICAL FLOW:



PROPOSED MATERIALS, STRUCTURE AND CONSTRUCTION, CLIMATOLOGICAL MEASURES, AESTHETICS:

MATERIALS:

- Structure grid module
- R.C.C. slab and frame construction with brick infill walls is the main constructional process.
- Brick and concrete paving in the open spaces to make surfaces low in maintenance.

STRUCTURE AND CONSTRUCTION

The trend system of structural framing.

- Reinforcement concrete frame.
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- Two way grid
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- Slip form construction.
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- Shear walls/ Prestressed concrete.

REINFORCEMENT CONCRETE FRAME:

- A. Modular Systems.
- B. Irregular layout.
- C. Exterior Columns
- D. Column shapes.

MODULAR SYSTEM

- Most columns are located on grid lines of uniform spacing.
- Necessity dictated by the need to provide space under apartment for parking.
- It is used as an Aesthetic element in Architectural design.
- No complication of beams.
- Systematic approach.
- Symmetry in design is maintained.

CLIMATOLOGICAL MEASURES:

- The orientation of all the blocks are in such a manner that all the houses get direct sun light in either morning or evening hours of the day.
- The Prevailing direction of wind is South-West to North-East on the wind ward side, openings are provided into the blocks,
- Courtyard form for the building shall act the protect the internal environment from harsh climate. Also the East-West axis of the open space between front and rear with smaller.

AESTHETICS:

- An expressionistic language is used to conscribe the spaces. Expression of vertical and horizontal elements gives the form its functional and precise appearance.
- Relieved fenestration to high light the important and vital content of the buildings.
- Circulation modes like staircase and lifts are highlighted in their expression to signify their importance.
- Brick walled merge with the local lands cape, concrete grid and relate to the traditional architectural image.
- Land scaping elements of trees, green areas, shrubs, street furniture and plants amidst paved plazas are used to suit the climate and environment.
- The ground floor is provided with community utility and parking areas so for providing more space and volume. The modules are upper floors moving the same, forming open terraces on external sides.

ARCHITECTURAL CONTROLS:

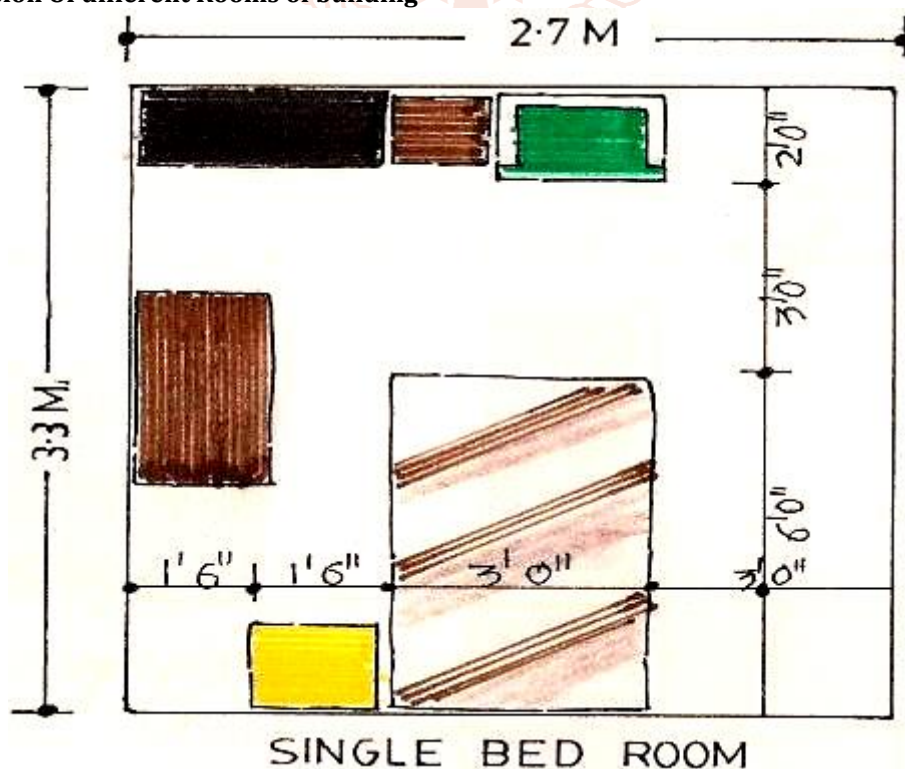
As there is no strict bye laws for Architectural controls, moderate control measures like, projection of columns, beams, chajjas etc. is done for climatological and aesthetical point off view.

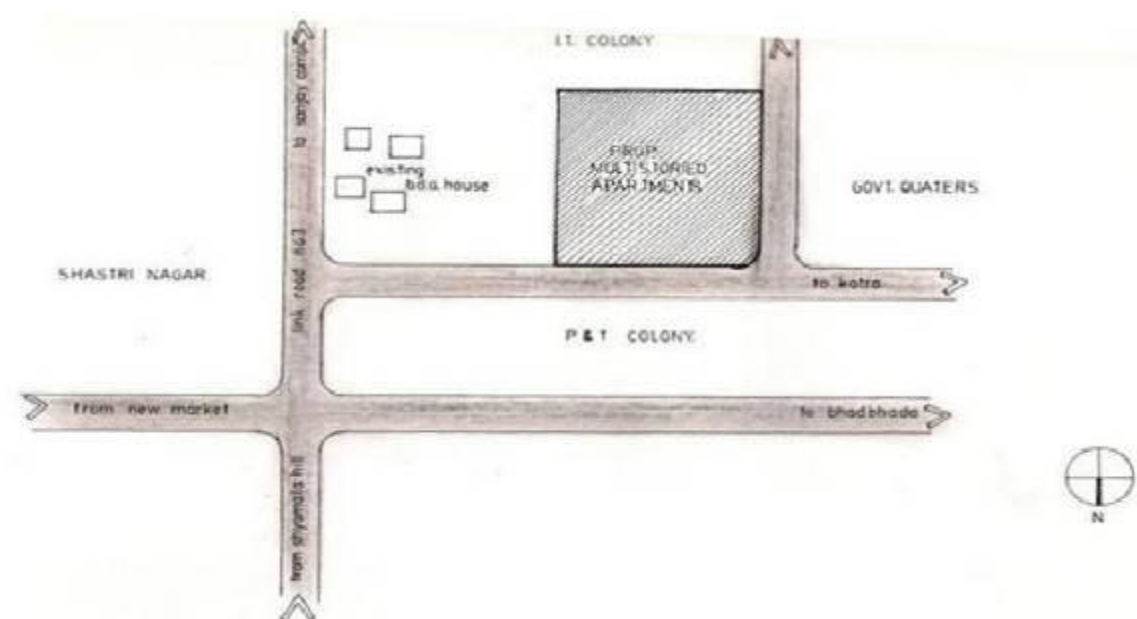
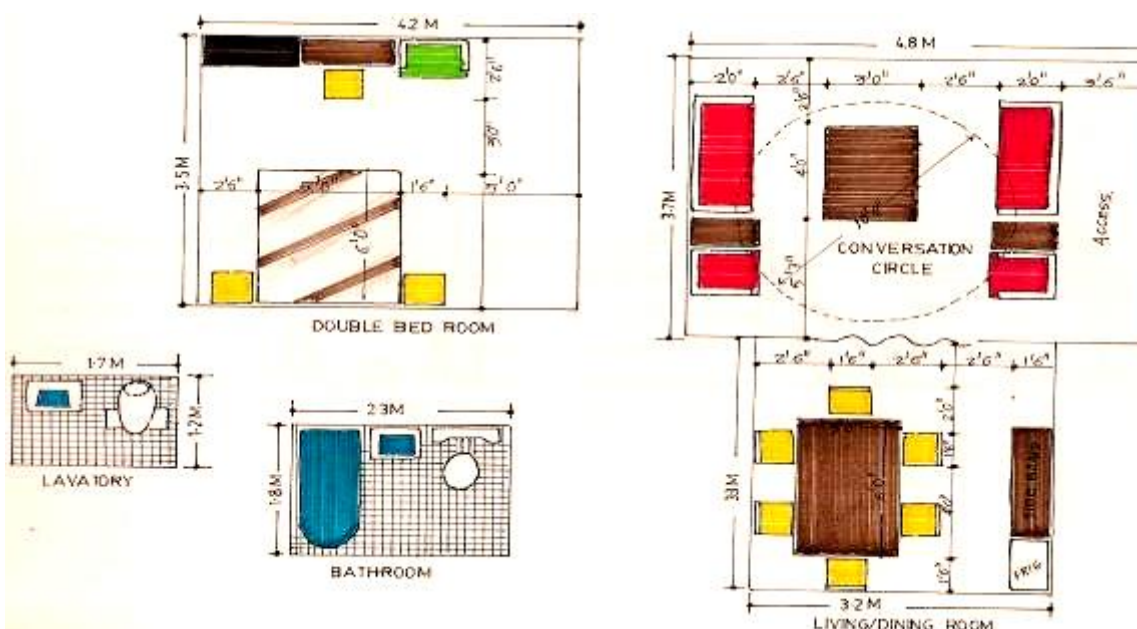
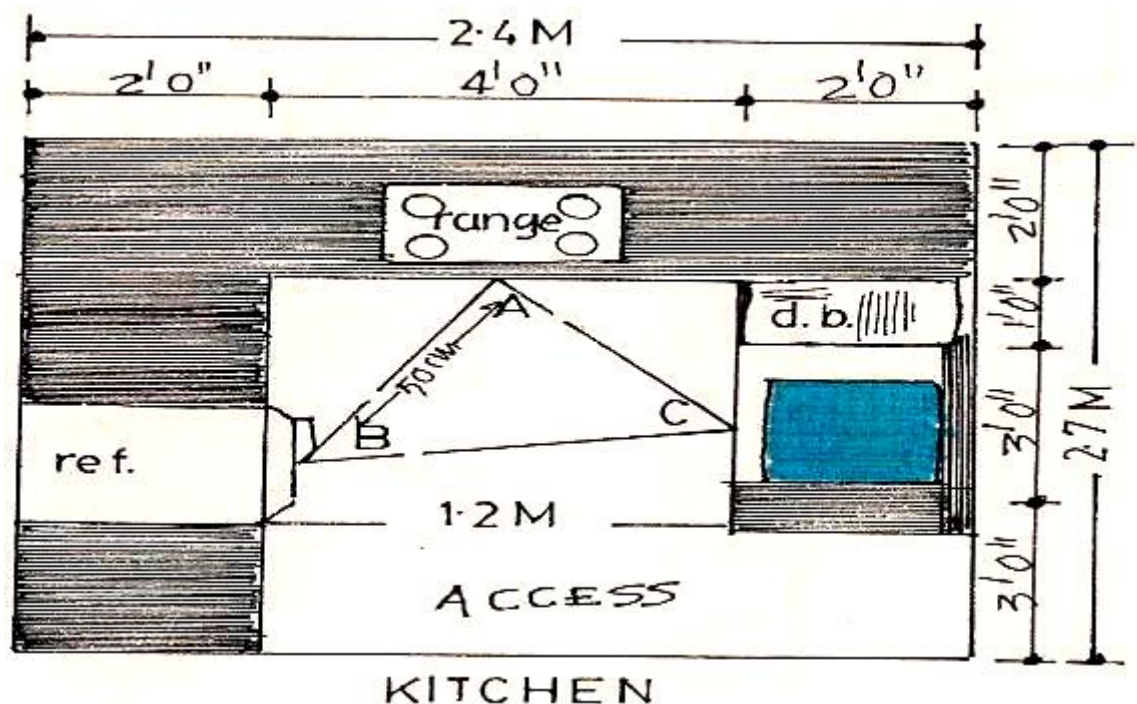
DETAILED ANALYSIS OF BUILDING SERVICES:

- In each building for vertical circulation, there are one staircase and 2 lifts serving 36 dwelling units,
 - Toilets of each units are separate pipe shaft. On the Ground floor, these ducts come in parking area where they can opened for cleaning and maintenance purpose.
 - For water supply, there are overhead water tanks above each block which will take care of water supply round the clock.
 - The capacity of the tank are so calculated that they also take care for fire fighting if a fire breaks out in the building (half the required water capacity is taken for fire fighting).
 - Refuse chutes are provided in the circulation area so that the open spaces around the building remain clean.
 - Proper covered parking facilities are provided in ground floor for residential components separately.
- (See drawing for the service network and dimensions)

Design and Planning Process

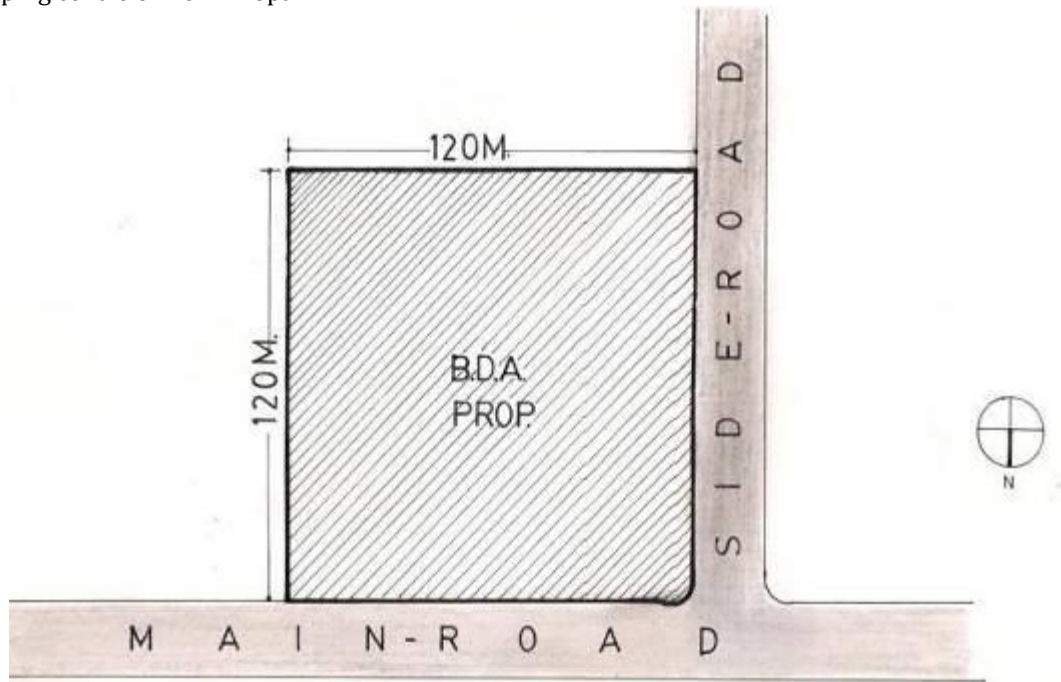
Come Out Dimension Of different Rooms of building





LOCATION PLAN:

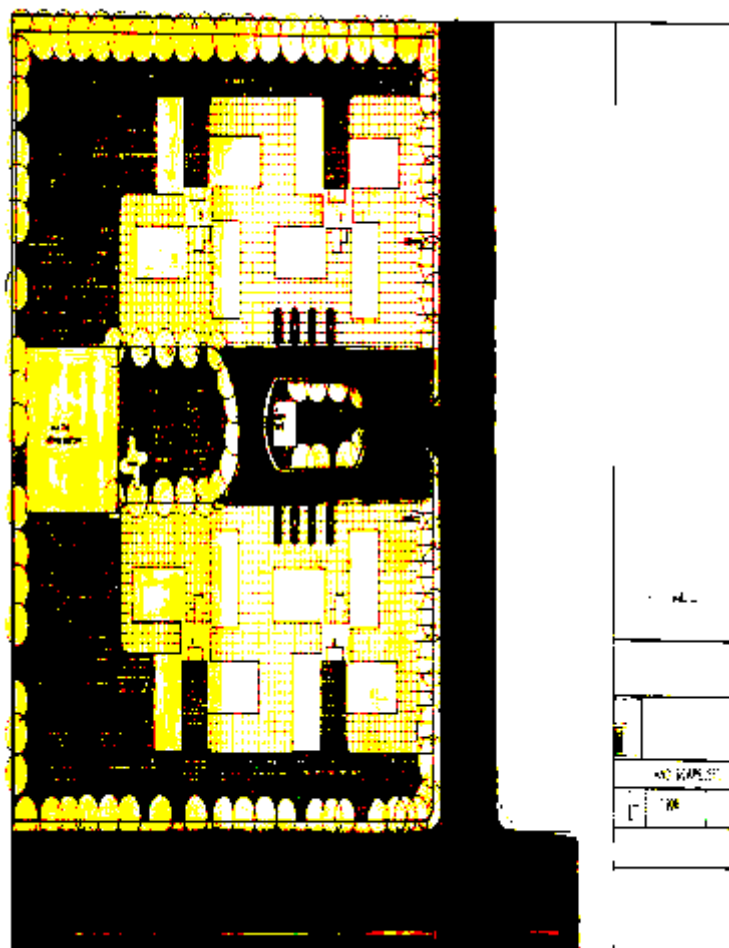
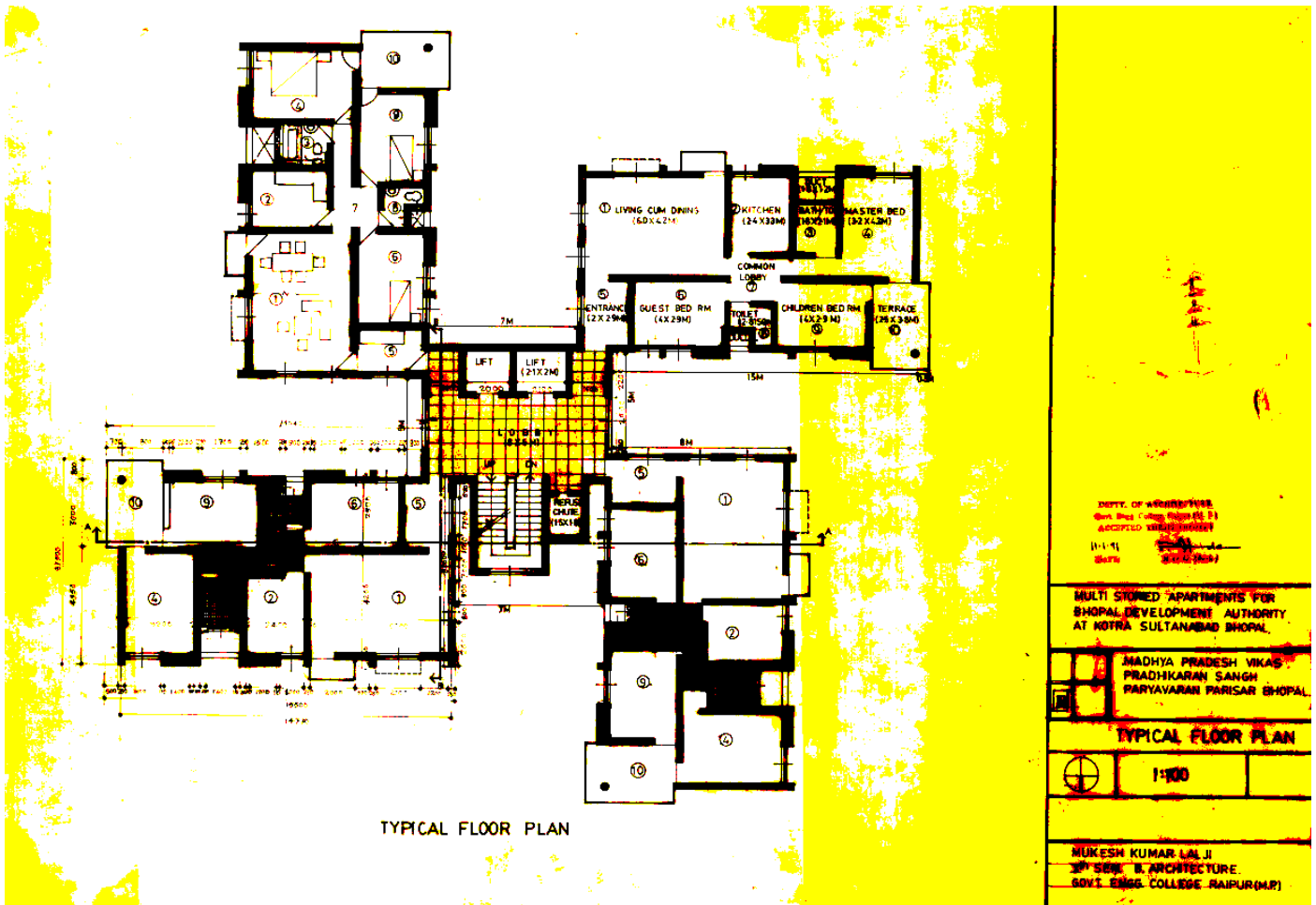
This site for multi storied apartments is situated at heart of kotra Sultanabad which is about one and half km. from New Market, the main shopping centre of New Bhopal.



SITE PLAN

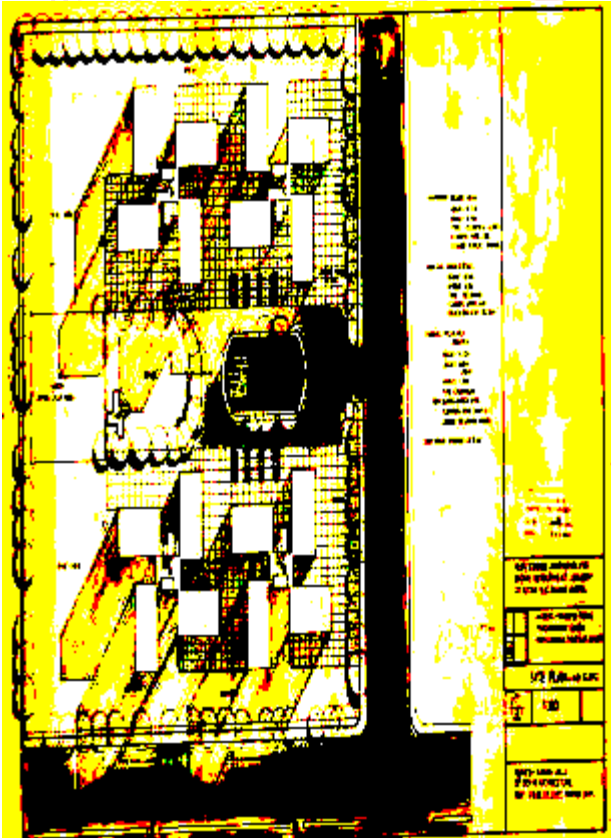


GROUND FLOOR PLAN





SITE PLAN WITH SCIOGRAPHY

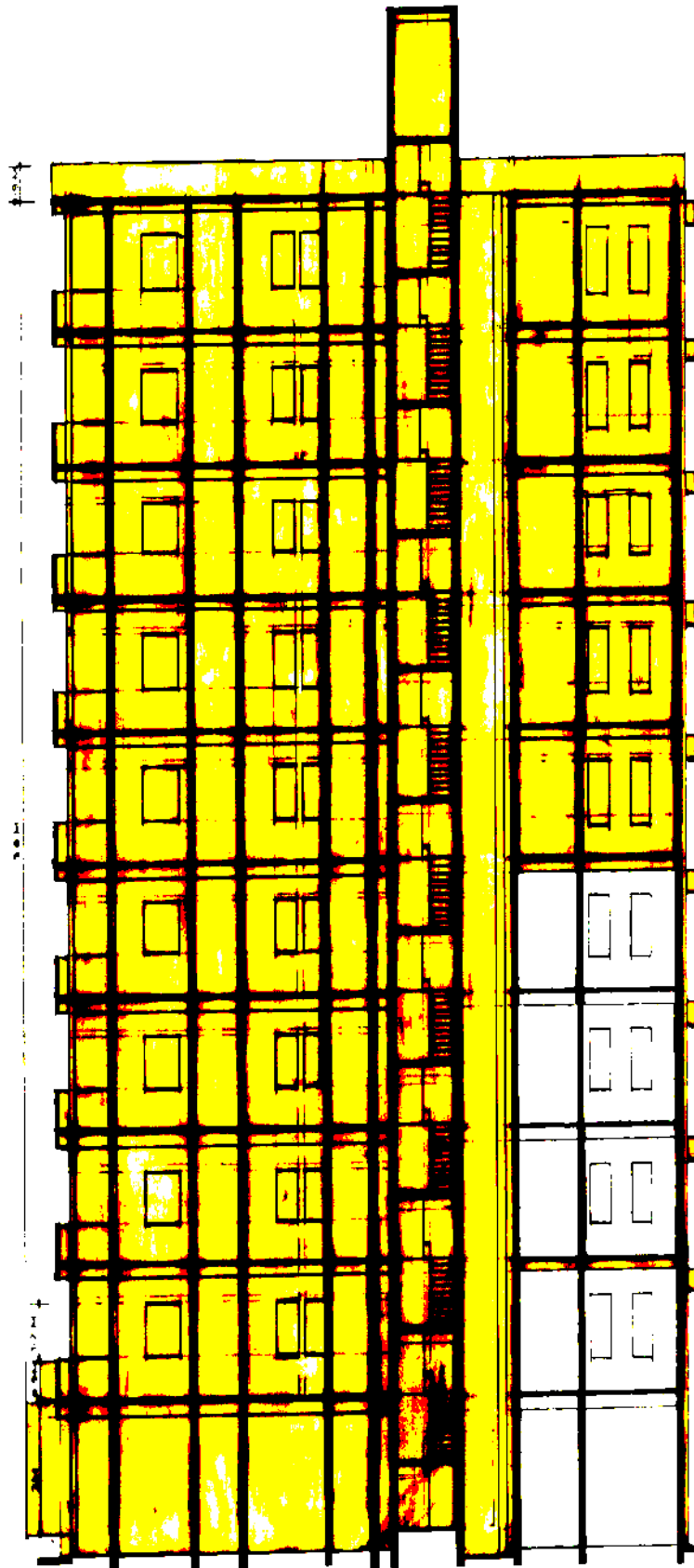


SITE PLAN WITH LAND SCAPE

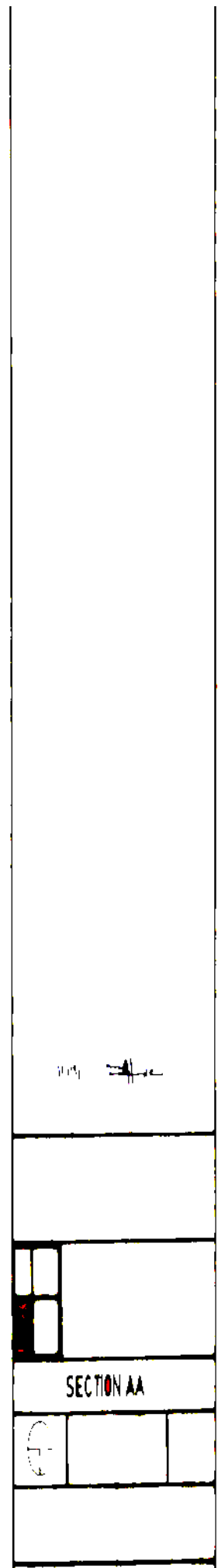


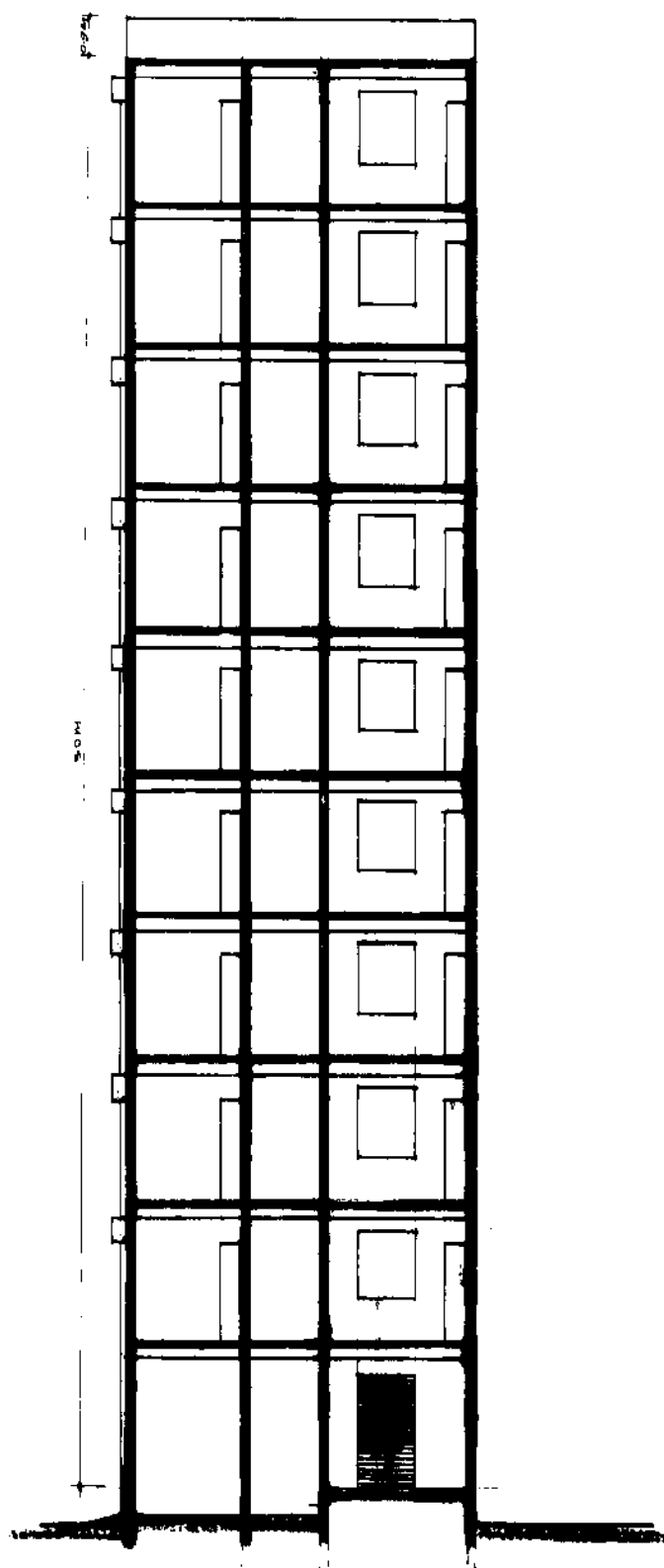
TYPICAL FLOOR PLAN






SECTION AA

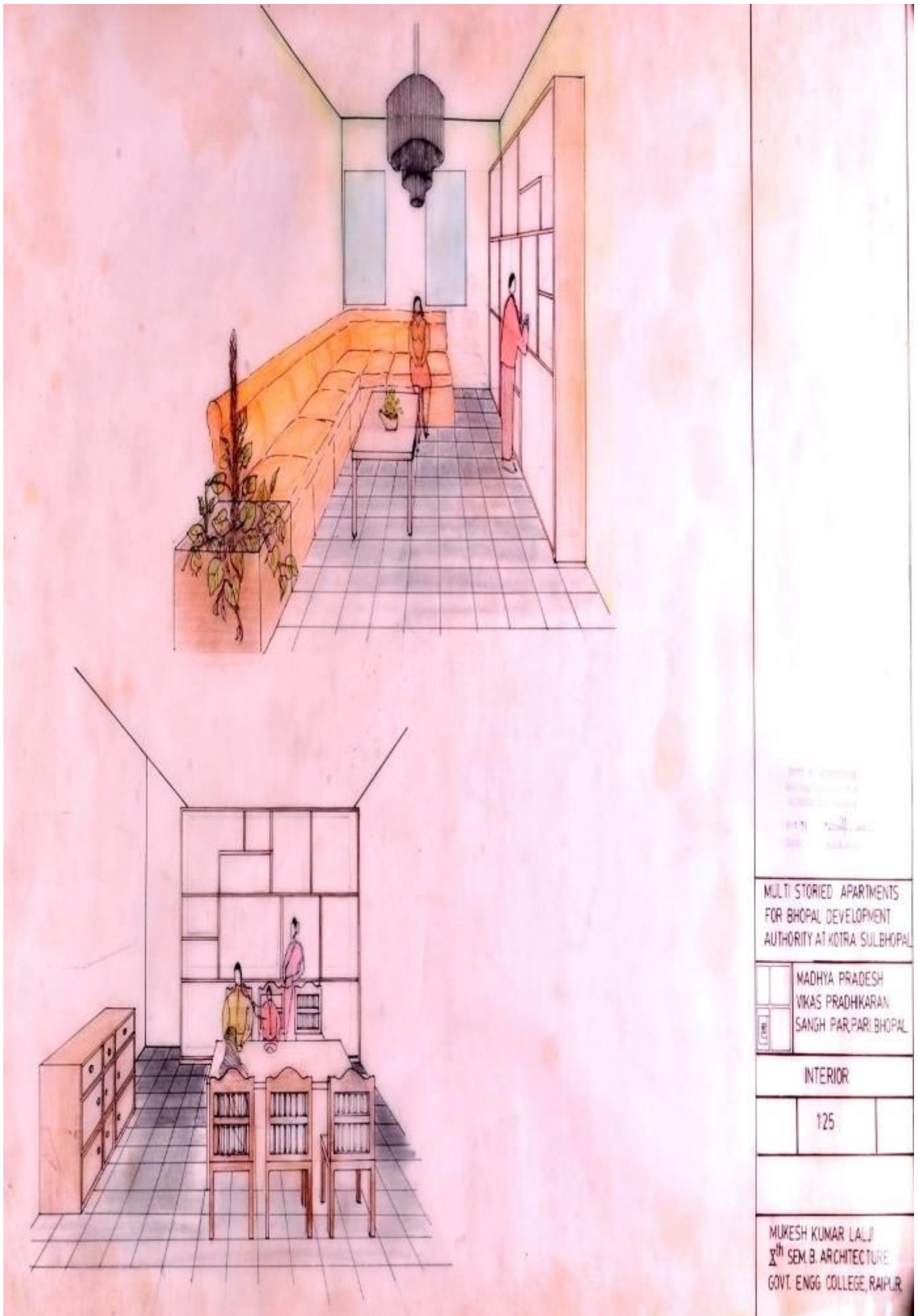




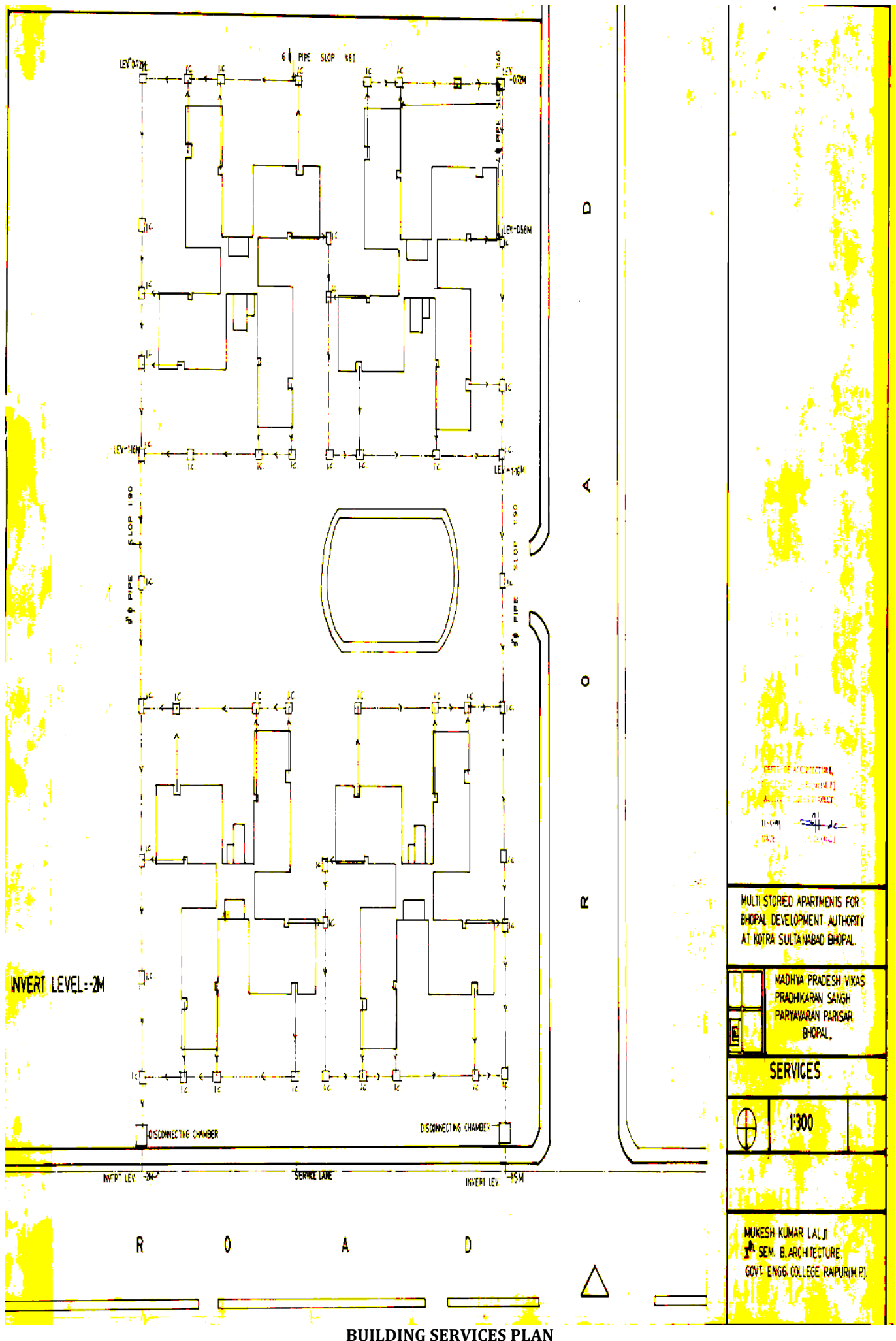
SECTION BB

SECTION BB

<p>DEPT. OF ARCHITECTURE Govt. Engg. College, Raipur (M.P.) ACCEPTED THESIS PROJECT</p> <p>H-1-91 DATE: 11.0.0. (AND)</p>		
<p>MULTI-STORIED APARTMENTS FOR BHOPAL DEVELOPMENT AUTHORITY AT KOTWA SULTANABAD BHOPAL.</p>		
<p>DR. PRADESH VIKAS SANGH PARYAVARAN PARISAR BHOPAL.</p>		
<p>SECTION BB</p>		
	<p>1:100</p>	
<p>MUKESH KUMAR LALJI 2ND SEM. B. ARCHITECTURE GOVT. ENGG. COLLEGE RAIPUR (M.P.)</p>		



INTERIOR VIEW OF TYPICAL FLAT



BUILDING SERVICES PLAN

REINFORCEMENT SCHEDULE OF FOOTINGS:

S.No	COLUMN No	SIZE OF FOOTING (METRES)	REINFORCEMENT IN A-x DIRECTION	REINFORCEMENT IN A-y DIRECTION	DEPTH OF FOOTING		REMARK
					AT THE FACE OF COLUMN	AT THE EDGE OF COLUMN	
1	C ₁	2.5M X 2.5M	16 Φ 150 Φ	16 Φ 150 Φ	900mm	200mm	
2	C ₂	2.2M X 3.2M	12 Φ 100 Φ	12 Φ 150 Φ	800mm	200mm	
3	C ₃	1.5M X 1.5M	12 Φ 150 Φ	12 Φ 150 Φ	600mm	200mm	

REINFORCEMENT SCHEDULE OF COLUMNS:

NAME OF COLUMN	No. OF COLUMNS	SIZE IN (CMS)	REINFORCEMENTS		SECTION
			MAIN	TIES	
C ₁	12	230X800	25 Φ -12No	8 Φ 150 Φ	
C ₂	6,4	230X600	25 Φ -8No 20 Φ -4No	8 Φ 150 Φ	
C ₃	6	230X230	16 Φ -8No	6 Φ 150 Φ	

REINFORCEMENT FOR BEAMS:

BEAM No	BEAM SIZE	TOP REINFORCEMENT		BOTTOM REINFORCEMENT		DIA	STIRRUPS	
		THROUGH SUPPORT	AT CANTILEVER	THROUGH SUPPORT	MID SPAN		DISTANCE AT SUPPORT	AT CENTER
B ₁	230X300	3-12 Φ	2-12 Φ	2-12 Φ	4-12 Φ	12 Φ	6 Φ 150 Φ	6 Φ 150 Φ
B ₂	230X300	2-12 Φ	2-12 Φ	2-12 Φ	4-12 Φ	12 Φ	6 Φ 150 Φ	6 Φ 150 Φ
B ₃	230X400	3-16 Φ	3-16 Φ	3-12 Φ	3-12 Φ	12 Φ , 16 Φ	8 Φ 150 Φ	8 Φ 200 Φ
B ₄	230X300	2-12 Φ	2-12 Φ	2-12 Φ	2-12 Φ +2-16 Φ	12 Φ , 16 Φ	8 Φ 150 Φ	8 Φ 200 Φ
B ₅	230X300	2-16 Φ	2-16 Φ	2-12 Φ	2-12 Φ +2-16 Φ	12 Φ , 16 Φ	8 Φ 150 Φ	8 Φ 200 Φ

REINFORCEMENT FOR SLABS:

SLAB PANEL	THICKNESS	MAIN REINFORCEMENT		SECONDARY REINFORCEMENT		REMARKS
		BOTTOM ALT. BENT UP	TOP EXTRA AT SUPP	BOTTOM ALT. BENT UP	TOP EXTRA AT SUPPORT	
S ₁	130mm	10 Φ 120 Φ	10 Φ 250 Φ	6 Φ 150 Φ	6 Φ 150 Φ ON TOP	
S ₂	130	8 Φ 120 Φ TOP BAR WILL BE EXTENDED IN THE PROJ. TERRACE SLAB	8 Φ 250 Φ UP TO IN THE TERRACE	8 Φ 120 Φ	8 Φ 250 Φ	
S ₃	130	12 Φ 150 Φ	12 Φ 150 Φ	6 Φ 150 Φ	6 Φ 150 Φ	



MULTI STORED APARTMENTS FOR
BHOPAL DEVELOPMENT AUTHORITY
AT KOTRA, SULTANABAD, BHOPAL

MADHYA PRADESH VIKAS
PRADHARAN SANGH
PARIVARAN PARISAR
BHOPAL

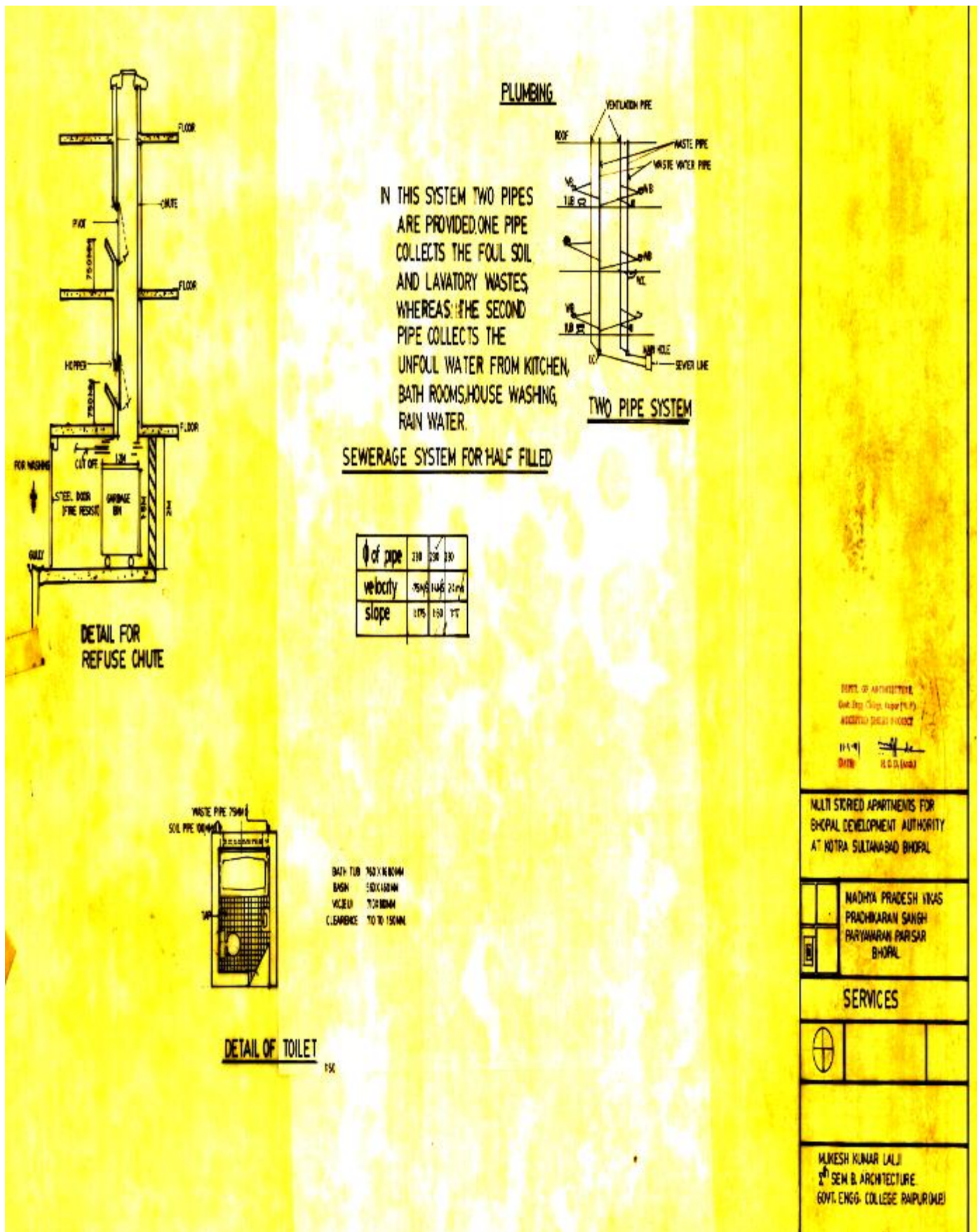
STRUCTURAL DETAILS



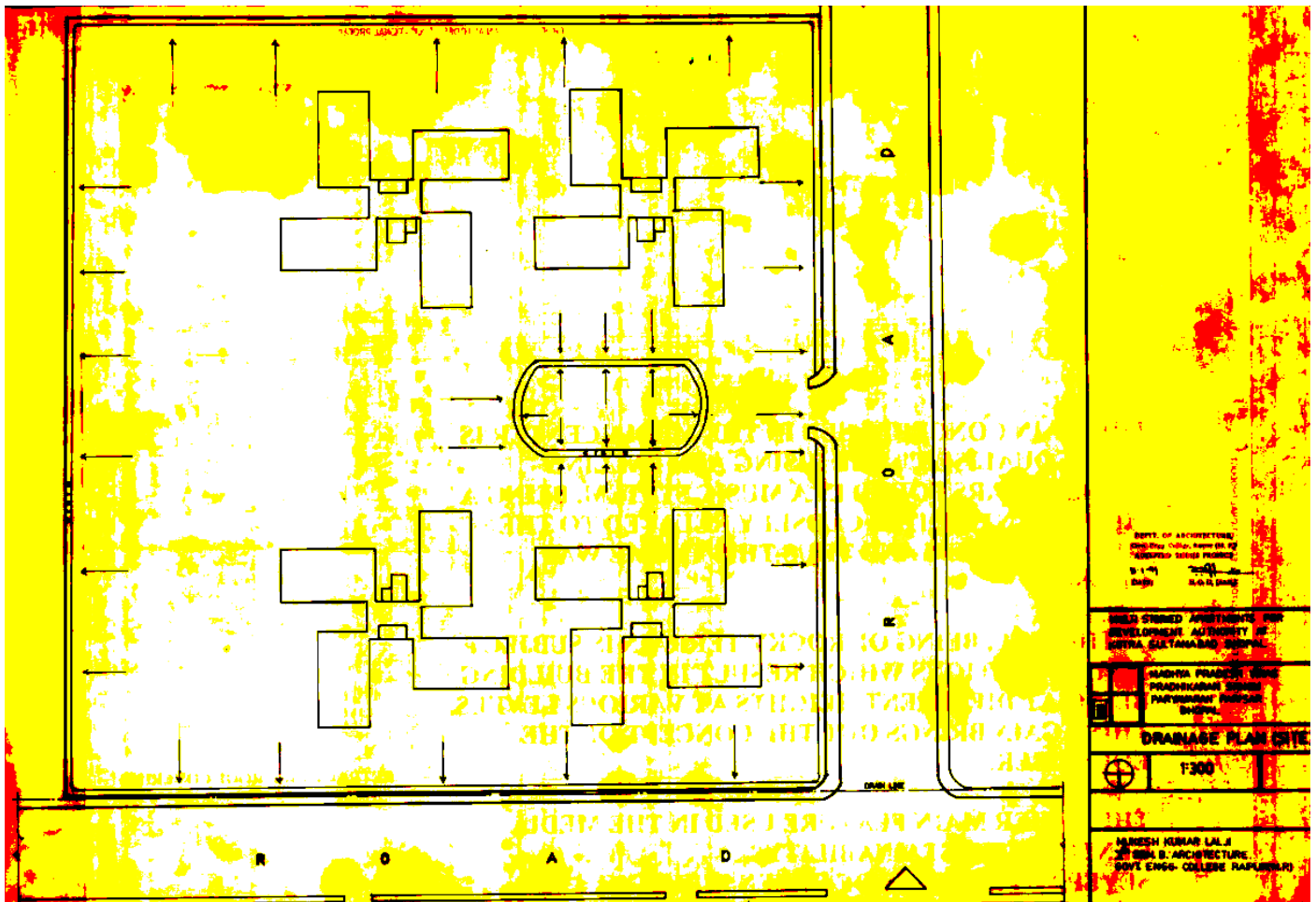
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MUKESH KUMAR LALJI
SEM. B. ARCHITECTURE
BONTENGG-COLLEGE, RAIPUR (M.P.)

STRUCTURAL DETAILS



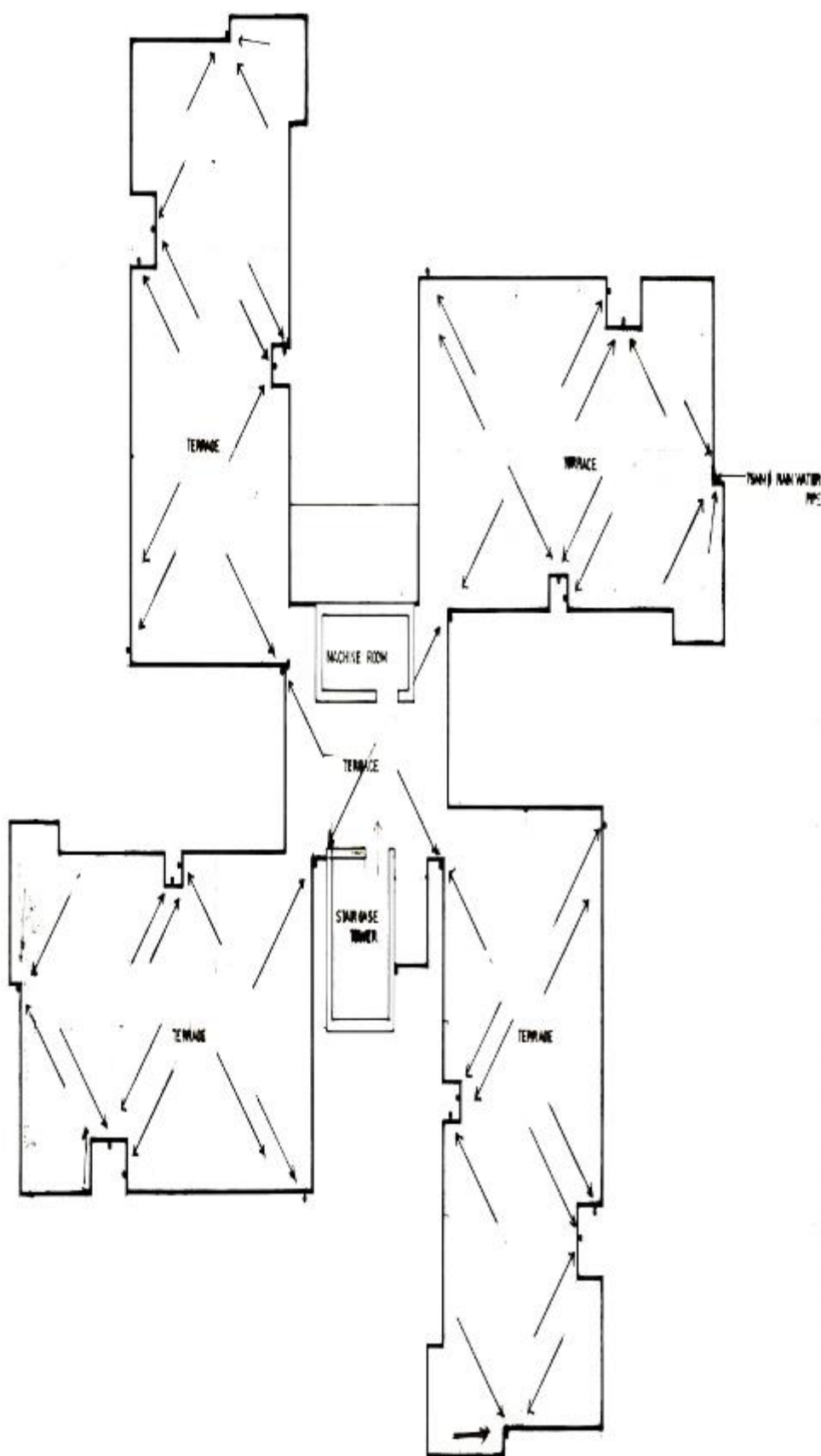
DETAIL OF BUILDING SERVICE



DRAINAGE FLOOR PLAN

of Trend in Scientific
Research and
Development

ISSN: 2456-6470



DEPT. OF ARCHITECTURE
Govt. College, Raipur (M.P.)
ACCEPTED TESIS PROJECT

11-11-19
DATE
[Signature]
BLOCK (11-11-19)

MULTI STORIED APARTMENTS FOR
BHOPAL DEVELOPMENT AT KOTRA
SULTANABAD BHOPAL .



MADHYA PRADESH VIKAS
PRADHIKARAN SANGH
PARYAVARAN PARISAR
BHOPAL

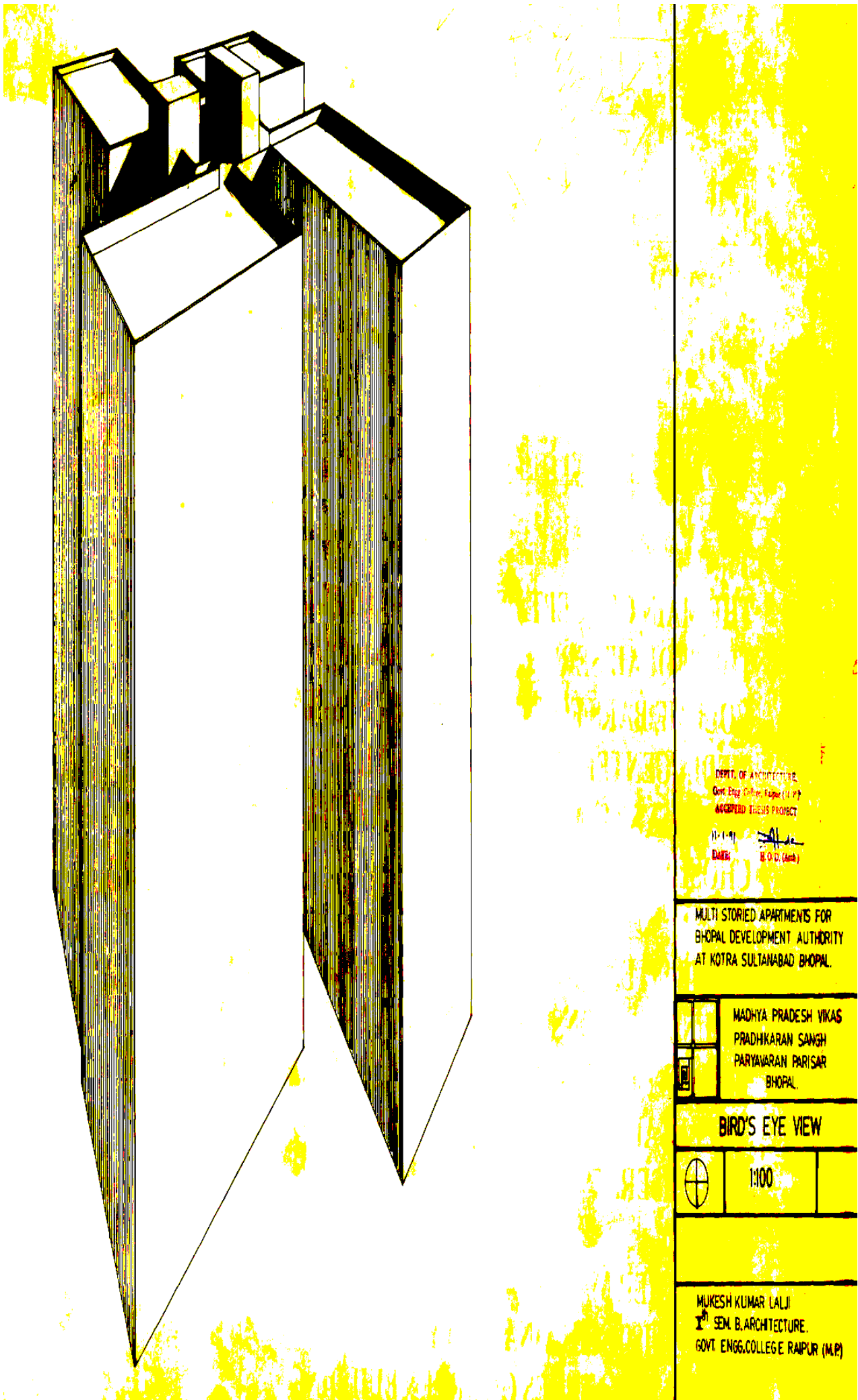
TERRACE FLOOR PLAN

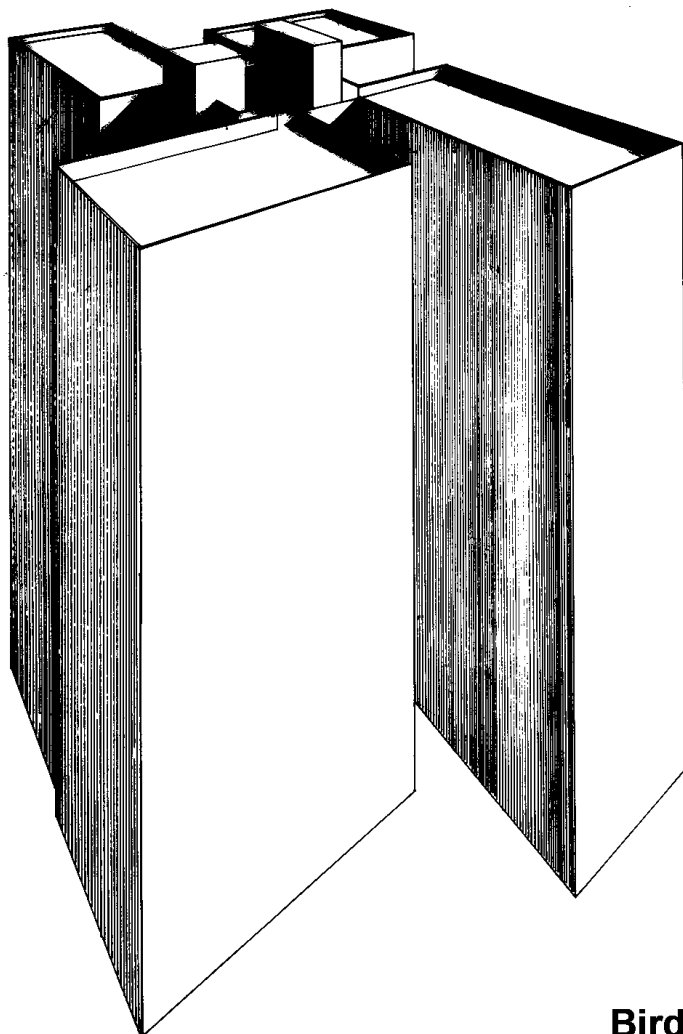


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MUKESH KUMAR LALI
X SEM B. ARCHITECTURE
GOVT. ENGG. COLLEGE RAIPUR (M.P.)

TERRACE FLOOR PLAN

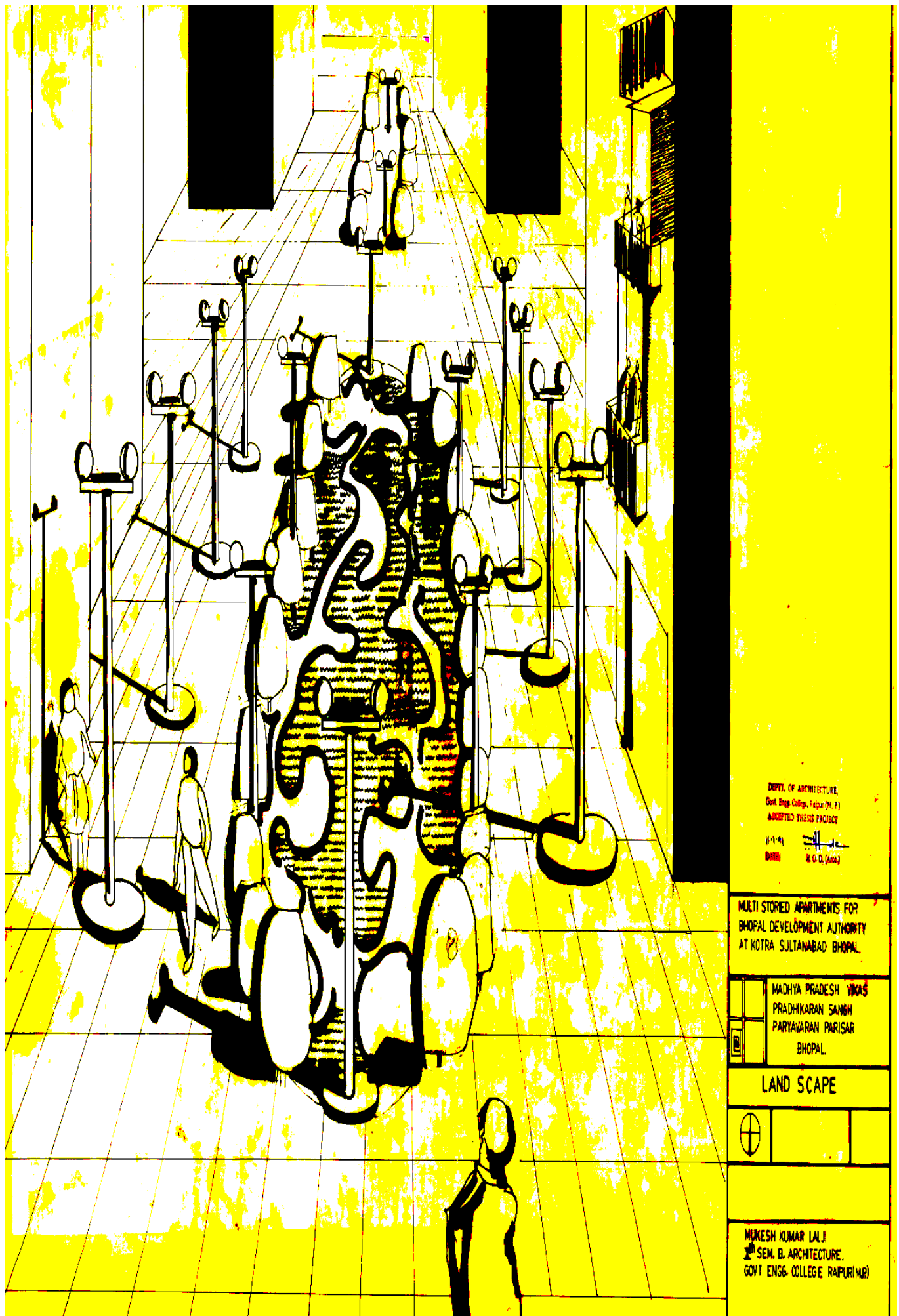




Bird's Eye View

MULTI STORIED APARTMENTS FOR BHOPAL DEVELOPMENT AUTHORITY AT KOTRA SULTANABAD BHOPAL		
	MADHYA PRADESH VIKAS PRADHIKARAN SANGH PARYAVARAT, PARISAR BHOPAL	
BIRD'S EYE VIEW		
	1:100	
MUKESH KUMAR LAJJI X th SEM. B.ArchITECTURE GOVT. ENGG.COLLEGE RAIPUR (M.P.)		





ONE POINT PERSPECTIVE OF GARDEN



PERSPECTIVE VIEW

CONCLUSIVE ACHIEVEMENTS

- High rise building to accommodate a higher density of the higher income group has been provided at Kotra sultanabad, Bhopal,
- The scheme provides for luxurious flats in a pleasant setting of wide open spaces and greenery.
- The infrastructural requirements of such building like proper light and ventilation, services, green spaces, parking etc. which are so often over looked have been carefully dealt within the proposal.

RECOMMENDATIONS

- To provide better living conditions to the general public a lot of infrastructure is needed which is often neglected by builders/promoters.
- To avoid this situation bye laws are required to safe guard the public interest.
- However, the Municipal Corporation has not proposed any such bye laws regarding parking, garbage disposal etc. These facilities as provided in the proposal should be included in the local bye laws.

APPENDICES

COMMON Name	Botanical Name	Height	Spread	Type	Flowers	Colour
Gulmohar	Delonix Regia	10-12m	8-10m	Deciduous leaves	April-june	Scarlet Orange
Amaltas	Casia Fistula	9-12m	6- 9m	Deciduous	April-May	Brilliant yellow
Ashoka	Polyaslthea	15-20m	7-10m	Evergreen	star shaped	yellowish Green

CALCULATIONS FOR WATER REQUIREMENTS

1.	Drinking	:	35 litres per head per day.
2.	Clothing	:	40 litres per head per day.
3.	Bath and Utensils	:	35 liters per head per day.
4.	Flushing Cistern	:	45 liters per head per day
5.	Gardening	:	40 liters per day

Per capita per day	:	210 liters
Per family five members	:	5 X 210 = 1050 Say = 1,200 liters
Ground floor + 9 storied per block 9 flats	:	= 9x1200 = 1,08,000 liters = 10,800,000 C.C.

LIFT CAR SIZE

NO OF PERSON	CONTRACT LOAD (kg.)	CAR INTERNALD 9MM)	SHAFT DIMENSION (MM)	REMARK
4	270	1100X925	1760X1160	COUNTER WEIGHT. ON ONE SIDE COUNTER WEIGHT ON THE BACK
6	400	1850X1100	1875X1330	
8	540	1130X1150	2036X1800	
10	675	1800X1200	2200X1700	
13	900	1900X1400	2300X1900	
16	1125	2100X1500	2500X2000	
20	1350	2100X1650	2500X2150	
26	1800	2400X1800	2830X2400	

NO. OF PERSON	S.NO POSSIBLE STOPS			
6	6	15	30	STORIES
8	4	5	5	Floors floor No
12	5	7	7	
80	5	9	10	
	0	12	15	

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